What is claimed is:

1. A heat transfer system which comprises:

a supply tube having a proximal end and a distal end;

a capillary tube having a proximal end and a distal end, with said proximal end thereof connected in fluid communication with said distal end of said supply tube;

a tip member positioned to surround said distal end of said capillary tube forming a cryo-chamber therebetween;

a source of refrigerant fluid, connected in fluid communication with said proximal end of said supply tube;

a means for introducing the refrigerant fluid into said supply tube at a working pressure "p_w", for transfer of the refrigerant fluid through said supply tube and through said capillary tube to exit from said distal end of said capillary tube and into said cryo-chamber in a substantially liquid state, for transition of the refrigerant fluid into a gaseous state with a tip pressure "p_t" and a tip temperature "T_t", for heat transfer through said tip member and into the gaseous fluid refrigerant in said cryo-chamber;

a temperature sensor for measuring the tip temperature "T_t"; and

a means connected to said temperature sensor and to said introducing means for controlling said working pressure "p_w" according to the tip temperature "T_t" to minimize the tip temperature "T_t."

2. A system as recited in claim 1 wherein said refrigerant fluid is nitrous oxide (N_2O).

3. A system as recited in claim 1 wherein said working pressure "p_w" is in a range between three hundred and fifty psia and five hundred psia.

4. A system as recited in claim 1 wherein a pressure regulator is in fluid communication with said source of said fluid refrigerant and said controlling means.

5. A system as recited in claim 1 wherein said temperature sensor is mounted on an interior surface of said tip member.

6. A system as recited in claim 1 wherein said temperature sensor is mounted on said distal end of said capillary tube.

7. A system as recited in claim 1 wherein said tip pressure "p_t" is less than one atmosphere.

8. A system as recited in claim 1 wherein the tip temperature, "T_t", is less than minus eighty-four degrees Centigrade ($T_t < -84°C$).

9. A system as recited in claim 1 wherein said controlling means is a system controller which comprises: a signal receiver, a processor, and a pressure control algorithm.

10. A heat transfer system which comprises:

a means for providing a liquid refrigerant at a first pressure;

a means for reducing the pressure on said liquid refrigerant from said first pressure to a second pressure;

a means for introducing said liquid refrigerant into a cryo-chamber at said second pressure for transition of said liquid refrigerant into a gaseous state in said cryo-chamber to cause heat to transfer from outside said cryo-chamber, into said cryo-chamber;

a means for sensing a temperature in said cryo-chamber; and

a means connected to said sensing means and to said introducing means for controlling said first pressure according to the temperature in said cryo-chamber to minimize the temperature in said cryo-chamber.

11. A system as recited in claim 10 wherein said liquid refrigerant is nitrous oxide (N_2O).

12. A system as recited in claim 10 wherein said reducing means comprises:

a supply tube having a proximal end and a distal end; and

a capillary tube having a proximal end and a distal end, with the proximal end thereof connected in fluid communication with the distal end of said supply tube.

13. A system as recited in claim 10 wherein said sensing means is a temperature sensor mounted in said cryo-chamber.

14. A system as recited in claim 12 wherein said sensing means is a temperature sensor mounted on said distal end of said capillary tube.

15. A system as recited in claim 10 wherein said means for controlling said first pressure comprises: a system controller, a processor, a pressure control algorithm, and a pressure regulator.

16. A method for transferring heat which comprises the steps of:

providing a liquid refrigerant at a first pressure;

reducing the pressure on said liquid refrigerant from said first pressure to a second pressure;

introducing said liquid refrigerant into a cryo-chamber at said second pressure for transition of said liquid refrigerant into a gaseous state in said cryo-chamber to cause a transfer of heat from outside said cryo-chamber, through a tip, and into said cryo-chamber;

sensing a tip temperature, "T_t";

electronically communicating said tip temperature "T_t" to a system controller; and

controlling said first pressure according to said tip temperature "T_t" to minimize said tip temperature, "T_t".

17. A method as recited in claim 16 wherein said liquid refrigerant is nitrous oxide (N_2O).

18. A method as recited in claim 16 wherein said first pressure is a working pressure "p_w" in a range between three hundred and fifty psia and five hundred psia, and said second pressure is a tip pressure "p_t" of less than one atmosphere.

19. A method as recited in claim 16 wherein the tip temperature "T_t" is less than minus eighty-four degrees Centigrade ($T_t < -84°C$).

20. A method as recited in claim 16 wherein said controlling the first pressure step comprises the steps of:

receiving a tip temperature "T_t" from a temperature sensor;

processing a control algorithm;

calculating an adjustment to said first pressure; and

controlling said first pressure.